# 20: CLT-based Confidence Intervals for Means

**Stat 120 | Fall 2025**

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1. (Adapted from Exercise 6.128)

   Plastic microparticles contaminate shorelines. Much of the pollution comes from washing fleece clothing. In a recent study, washing a fleece garment discharged on average $\bar{X} = 290$ fibers per liter of wastewater. The standard deviation was $s = 87.6$ fibers and the sample size was $n = 120$.

(a) What is the estimated *standard error* of the average number of fibers discharged per liter of wastewater when washing a fleece garment?

(b) The table below gives some percentiles of the $t_{119}$ distribution. Use this information to construct a 99% confidence interval for the population mean. Interpret the interval in context.

| percentage | percentile (`qnorm(percentage)`) |
|---|---|
| 90% | 1.3 |
| 95% | 1.6 |
| 97.5% | 2.0 |
| 99% | 2.3 |
| 99.5% | 2.6 |

(c) What sample size would we need if we wanted this interval to be *no wider* than 20?